An Acad Bras Cienc (2022) 94(1): e20190862 DOI 10.1590/0001-3765202120190862
Anais da Academia Brasileira de Ciências | *Annals of the Brazilian Academy of Sciences*
Printed ISSN 0001-3765 I Online ISSN 1678-2690
www.scielo.br/aabc | www.fb.com/aabcjournal

ECOSYSTEMS

Sea anemones (Cnidaria, Anthozoa, Actiniaria) in high sedimentation environments influenced by the Magdalena River (Colombian Caribbean)

JEFERSON DURÁN-FUENTES, ADRIANA GRACIA & RICARDO GONZÁLEZ-MUÑOZ

Abstract: Fifteen species of sea anemones (Cnidaria, Actiniaria) have been recorded so far in the Colombian Caribbean, comprising approximately 28% of the total number of known species in the Caribbean Sea. Most species recorded are associated with coral reef communities. However, in the region, no records of sea anemones are known from areas with high sedimentation conditions as is characteristic along the coastline of the Atlántico Department, in Colombia. In this area, organisms are exposed to a high degree of turbidity and sedimentation (~143.9x10^6 t year^{-1}) as a result of their proximity to the Magdalena River mouth and the 26 micro-basins that flow along its coastline. Several observations and collections were made on soft bottoms, rocky, and artificial substrates in the sectors of Puerto Velero and Caño Dulce to determine the fauna that exist under these conditions. Four species of sea anemones were found belonging to the families Actiniidae and Aiptasiidae, and images from living specimens and cnidae are provided. *Bunodosoma cavernatum* and *Exaiptasia diaphana* are here recorded for the first time from the Colombian Caribbean. An updated list of sea anemones in the Colombian Caribbean, now comprising 34 taxa (i.e., 21 species and 13 identified at supra-specific levels), is provided.

Key words: Actiniidae, Aiptasiidae, benthic invertebrates, colonization marginal, environments, turbidity.

INTRODUCTION

The Atlántico Department comprises a coastal area of the Colombian Caribbean of about 72 km coastline, which differs from other areas of the region due to influence from discharges of the Magdalena River. This is due to the fact that the Magdalena River is the main fluvial artery of Colombia that flows into the Caribbean Sea, and it is estimated ~143,9x10^6 t of sediments are dissolved into the sea each year (Restrepo et al. 2006, 2017). These local conditions imply that many of the organisms inhabiting the area are subject to substantial stress caused by high turbidity and resuspension rates that occur throughout most of the year. Therefore, this sector of the Colombian Caribbean is very important to understand the processes of settlement and colonization of marine invertebrate groups, including cnidarians which could be quite demanding in this respect of high sedimentation and turbidity.

The Atlántico Department is one of the least studied areas of the Colombian Caribbean in terms of its faunal biodiversity. Although the study of some marine invertebrates in Colombia has increased in the last few decades, the main group among cnidarians that have been researched is the stony corals (order Scleractinia) (e.g., Díaz et al. 1996, 2000, Cairns 1999, Reyes 2000, Cendales et al. 2002, Vega-Sequeda et al. 2008, Reyes et al. 2010, Flórez & Santodomingo

2010). A few other studies related to hydrozoan, scyphozoan and cubozoan medusae are known for the Atlántico Department (e.g., Durán-Fuentes et al. 2018), but research about the diversity, distribution, and the ecological traits of other cnidarians, such as the sea anemones (class Anthozoa, order Actiniaria), have not been carried out.

Sea anemones are among the benthic marine invertebrates that are commonly found in coastal intertidal zones and coral reefs worldwide. In the Colombian Caribbean, 21 species of sea anemones have been recorded so far, as well as 13 other species identified at supra-specific levels (i.e., genus, family, superfamily, or order) (Table I), comprising about the 28% of the total number of known species in the Caribbean Sea (González-Muñoz et al. 2012). Records of sea anemones in Colombia have been reported from Tayrona National Park in Santa Marta (Riemann-Zürneck 1972, Manjarrés 1977, 1978, Brattström 1980, Reyes & Campo 1992, Barrios-Suárez et al. 2002), the Rosario Island (Manjarrés 1979), San Andres, Providencia and Santa Catalina Islands (Werding et al. 1981, SIBM 2020), Cartagena Bay (Daly & den Hartog 2004), North-east (Flórez & Sandomingo, 2010, Gracia et al. 2013) and South-western Colombian Caribbean (Dueñas et al. 2019) (Table I), but no previous records of sea anemones are known from the Atlántico Department.

In this study, we documented the occurrence of four species of sea anemones in the Atlántico Department, belonging to families Actiniidae Rafinesque, 1815 and Aiptasiidae Carlgren, 1924, and short diagnoses and images from living specimens and cnidae are provided. The species *Bunodosoma cavernatum* (Bosc, 1802) and *Exaiptasia diaphana* (Rapp, 1829) are here recorded for the first time in the Colombian Caribbean, and the geographic distribution ranges of *Actinostella flosculifera* (Le Sueur, 1817) and *Bunodosoma granuliferum* (Le Sueur, 1817) are extended to the Atlántico Department. These records increase the number of sea anemone known for the Colombian Caribbean to 34 taxa. This study seeks to document which species of sea anemones inhabit the Atlántico Department as one of the first steps to understand the physiological processes involved in their presence in potentially stressful environmental conditions.

MATERIALS AND METHODS

Observations and collections of specimens were carried out in two locations of the Atlántico Department, Colombia (Fig. 1) from November 2018 to May 2019: Puerto Velero (three stations).- (1) PV1 (10°56'41.9"N 75°02'36.3"W), (2) PV2 (10°56'37.9"N, 75°02'27.0"W), (3) PV3 (10°56'55.5"N 75°02'09.8"W); and Caño Dulce Beach (two stations).- (1) CD1 (10°56'33.0"N, 75°01'35.3"W), (2) CD2 (10°56'10.2"N, 75°01'44.7"W). Collections were made on soft bottoms, rocky, and artificial substrates. The sea surface temperature in the area oscillates between 25.5 to 29.5 °C, and the salinity between 34.4 to 37 ppm (Posada & Henao 2008). Two rainy seasons (from Abril to May and from October to November) and two dry seasons, from December to March and from July to September (Rangel-Buitrago et al. 2017), occur in the area. The influence of the Magdalena River on the department´s coasts is evident, due to the presence of sediments as well as organic and inorganics materials (Rangel-Buitrago et al. 2017), with very low visibility of the water all year round.

Specimens were collected by hand and snorkeling, using a small shovel, a hammer, and a chisel. Specimens were relaxed using 5% $MgSO_4$ seawater solution and subsequently fixed in 10% formalin seawater (Häussermann

Table I. **Previous and new records of actiniarian species in the Colombian Caribbean. Species are listed alphabetically by family and species. The symbol "*" indicate new records for the locality found in the present study, "†" indicates new records for the Colombian Caribbean, and the citations of "1-13" indicates localities of previously published records. Abbreviation: (SW) South-western and (NE) North-eastern Colombian Caribbean, (SAI) San Andrés Island and (PSCI) Providencia and Santa Catalina Islands. Citation: 1- Riemann-Zürneck 1972; 2- Manjarrés 1977; 3- Manjarrés 1978; 4- Manjarrés 1979; 5- Brattström 1980; 6- Werding et al. 1981; 7- Reyes & Campo 1992; 8- Barrios-Suárez *et al*. 2002; 9- Daly & Den Hartog 2004; 10- Flórez & Sandodomingo 2010; 11- Gracia et al. 2013; 12- Dueñas et al. 2019; 13- SIMB 2020.**

Name taxa	Locality																	
	Cartagena	Isla del Rosario	Santa Marta	Punta Vigía	Burucuca	Punta Betín	Isla Aguja	Isla Morrito	Bahía Taganga	Ensenada de Concha	Ensenada de Neguage	Bahía Chengue	SW	NE	SAI	PSCI	Puerto Velero	Caño Dulce
Actiniaria fam. gen. sp.													12					
Family ACTINIIDAE Rafinesque, 1815																		
Actinostella flosculifera (Le Sueur, 1817). (= *P. pretexta*)		4				3				3	3						*	*
Anthopleura texaensis (Carlgren & Hedgpeth, 1952)	9																	
Isoaulactinia stelloides (McMurrich, 1889)	9																	
Bunodosoma cavernatum (Bosc, 1802) †																	*	*
Bunodosoma granuliferum (Le Sueur, 1817)						2					2					6	*	*
Condylactis gigantea (Weinland, 1860)		4	1	8		2	2, 8	2	2	2	2				13	13		
Leipsiceras pollens (McMurrich, 1898)														10				
Family AIPTASIIDAE Carlgren, 1924																		
Aiptasia sp. Gosse, 1858														11	13			
Bartholomea annulata (Le Sueur, 1817)		4	1	8		2	8		2	2	2				13	13		
Exaiptasia diaphana (Rapp, 1829) †																	*	
Laviactis lucida (Duchassaing de Fombressin & Michelotti, 1860). (= *H. lucida*)		4				3				3								
Family ALICIIDAE Duerden, 1895																		
Alicia sp. Johnson, 1861				8			8											
Lebrunia coralligens (Wilson, 1890)		4		8	3	3	3, 8	3		3	3					13		
Lebrunia neglecta Duchassaing & Michelotti, 1860. (= *L. danae*)		4		8		2	2, 8								13	13		
Family ANDVAKIIDAE Danielssen, 1890																		

Table I. Continuation.

Andvakiidae gen. sp. (= Isophellidae gen. sp.)				8			8											
Telmatactis rufa (Verrill, 1900)						3		3		3	3							
Telmatactis cricoides (Duchassaing, 1850)				8			8											
Family AMPHIANTHIDAE Hertwig, 1882																		
Amphianthus caribaeus (Verrill, 1899) (= *Amphianthus caribaea*)														10				
Family BATHYPHELLIIDAE Carlgren, 1932																		
Daontesia sp. Carlgren, 1942														10				
Family BOLOCEROIDIDAE Carlgren, 1924																		
Bunodeopsis sp. Andres, 1881															13	13		
Bunodeopsis antilliensis Duerden, 1897. (= *B. globulifera*)				8			8											
Family HALIACTINIDAE Carlgren, 1949																		
Halcampactis sp. Farquhar, 1898				8			8											
Family HORMATHIIDAE Carlgren, 1932																		
Actinauge longicornis (Verrill, 1882)														10				
Calliactis tricolor (Le Sueur, 1817)						2												
Hormathiidae gen. sp. Carlgren, 1932													12					
Monactis vestita (Gravier, 1918)														10				
Paracalliactis sp. Carlgren, 1928 (= *Adamsia* sp. Forbes, 1840)													12					
Phelliactis sp. Simon, 1892													12					
Family KADOSACTINIDAE Riemann-Zürneck, 1991																		
Kadosactinidae gen. sp. Riemann-Zürneck, 1991													12					
Family PHYMANTHIDAE Andres, 1883																		
Phymanthus crucifer (Le Sueur, 1817)		4				2			2	2	2				13	13		
Phymanthus sp. Milne Edwards & Haime, 1851				8			8											
Family STICHODACTYLIDAE Andres, 1883																		
Stichodactyla helianthus (Ellis, 1768). (= *S. helianthus*)		4						2		5	2	7				6		
Superfamily Metridioidea fam. gen. sp. Carlgren, 1893 (= Acontiaria fam. gen. sp.)				8			8											

2004). External anatomy of specimens was examined made using a stereoscope (Leica EZ4). Measurements of specimens were obtained from live and relaxed specimens. Squash preparations of small amounts of tissue from tentacles, actinopharynx, filaments, column, acrorhagi, acontia, and marginal projections were made from two specimens for each species. Cnidae were examined using a light microscope Leica DM750 (1000x oil immersion) with adapted camera (Leica ICC50W), photographed and haphazardly measured. Cnidae terminology follows Östman (2000). Taxonomic classification follows Rodríguez et al. (2014). The synonym list for each species only contains a reference to the first citation of the species by a particular name. Voucher specimens were deposited in the collection of Marine Biodiversity of the Universidad of Atlántico, Colombia (registration code: UARC-CNI 061- 072). Salinity and water transparency data were recorded from February to June 2019 using a salinometer (Pocket salt-meter ATAGO) and a Secchi disk (through horizontal visibility at a depth of 1 m).

RESULTS

During the studied period (February to June 2019), the salinity measured in the sampled locations ranged from 27 to 28 ppm, and water transparency from 35 to 205 cm (Table II). A total of twelve specimens were collected, classified in two families, three genera, and four species.

Taxonomic treatment

Phylum Cnidaria Verrill, 1865
Class Anthozoa Ehrenberg, 1834
Subclass Hexacorallia Haeckel, 1900
Order Actiniaria Hertwig, 1882
Suborder Enthemonae Rodríguez & Daly in Rodríguez et al. 2014
Superfamily Actinioidea Rafinesque, 1815
Family Actiniidae Rafinesque, 1815
Genus *Actinostella* Duchassaing, 1850

***Actinostella flosculifera* (Le Sueur, 1817)**

(Figs. 2a-n)

Examined material: Puerto Velero Beach (PV3), two specimens (UARC-CNI 066, UARC-CNI 070).

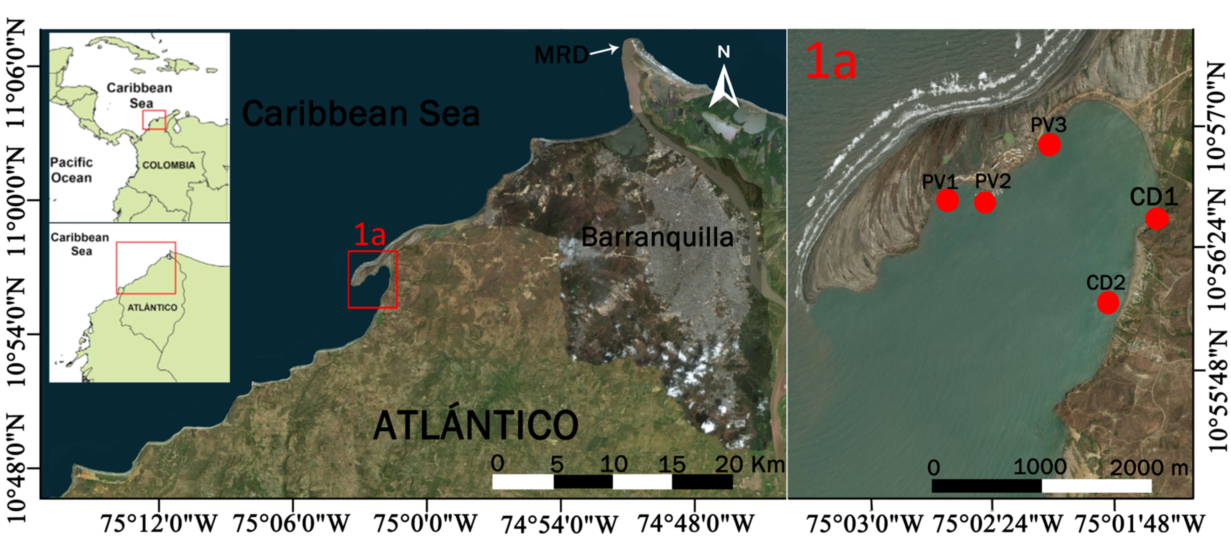

Figure 1. Map of the study area on the shallow shore of the Atlántico Department. 1a: Puerto Velero Bay, PV1 and PV2: Marina, PV3: Puerto Velero beach, CD1 and CD2: Caño Dulce beach. MRD: Magdalena River Delta.

Table II. Recorded salinity and transparency of the water (Puerto Velero).

Date	Salinity	visibility of the water (cm)
February 21st, 2019	27	35-40
March 17th, 2019	28	35-40
March 27th, 2019	27	45-60
May 11th, 2019	27.4	180-205
May 18th, 2019	27.4	135-190
Jun 29th, 2019	27	55

External anatomy

Oral disc translucent pale-brown, often with white spots. Tentacles approximately 48 in number, hexamerously arranged in four cycles, smooth, conical, tapering distally, inner ones longer than outer ones, contractile, translucent pale-brown to light-pink color, with scattered small circular white spots. Column cylindrical to elongated, smooth but with small verrucae arranged in rows distally. Above verrucae lies a marginal ruff or collar with white and olive-green color. Pedal disc well-developed. Pedal disc and column light-pink. Zooxanthellate.

Internal anatomy: See González-Muñoz et al. (2012).

Cnidae: basitrichs, long curved basitrichs, spirocysts, microbasic *b*- and *p*-mastigophores (Figs. 2d-n; Table III).

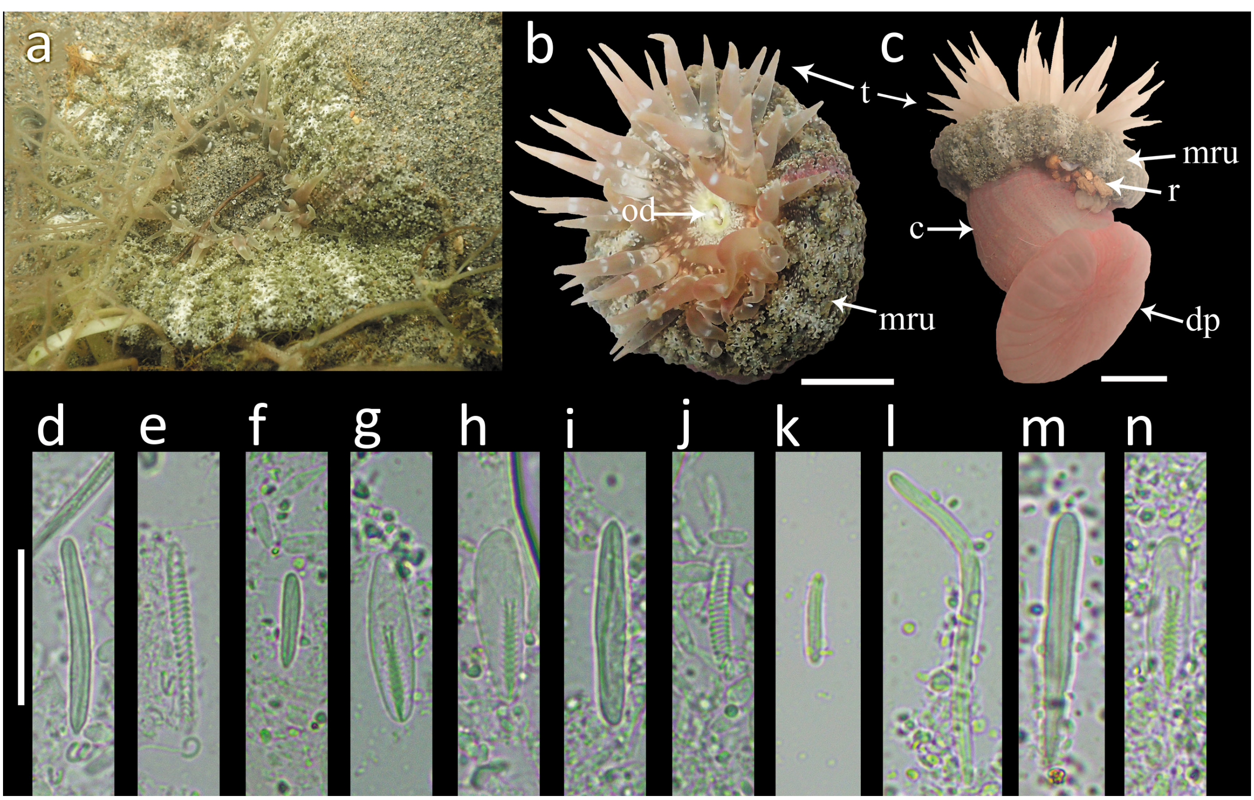

Figure 2. *Actinostella flosculifera* (Le Sueur, 1817). a live specimen in natural habitat. b oral view c lateral view. d-n Cnidae. –tentacle: d basitrich e spirocyst; column: f basitrich g microbasic *p*-mastigophore; actinopharynx: h microbasic *p*-mastigophore i basitrich j spirocyst; filament: k small basitrich l long curved basitrich m microbasic *b*-mastigophore n microbasic *p*-mastigophore. Abbreviations. –c: column, mru: marginal ruff, od: oral disc, pd: pedal disc, r: rock, t: tentacle, vs: vesicles. Scale bars: b-c: 10 mm; d-n: 20 µm.

Table III. Size and distribution of cnidom in the sea anemones in the Atlántico Department. Abbreviation- al/ aw: average length/ average width; dl/dw: standard density/ standard width; #1 or #2: number of cnidocysts in specimen 1 or 2; p: proportion.

Species	Tissue	Cnidae	Capsule length (цm) (min-max)	al	dl	Capsule width (цm) (min-max)	aw	dw	# 1	# 2	p
Actinostella flosculifera	Tentacle	Basitrich	9.73 - 19.88	17.03	3.24	1.79 - 2.69	2.18	0.255	0	34	1/2
		Basitrich	20.03- 30.22	24.39	2.69	1.86 - 3	2.43	0.23	14	21	2/2
		Spirocyst	7.71 - 25.68	13.84	3.55	1.5 - 2.65	2.14	0.29	34	35	2/2
	Actinopharynx	Basitrich	9.53 - 12.1	10.47	1.47	2.01 - 2.24	2.12	0.11	3	16	2/2
		Basitrich	16.41- 30.43	25.38	2.68	1.98 - 3.98	3.06	0.42	0	36	1/2
		Microbasic *p*-mastigophore	18.48 - 25.06	21.47	1.93	4.63 - 7.32	5.93	0.77	10	5	2/2
		Spirocyst	2.17 - 16	9.08	9.78	2.54 - 8.54	5.53	4.23	2	0	2/2
	Column	Basitrich	7.21 - 15.16	12.24	1.2	1.68 - 2.46	2.06	0.18	35	35	2/2
		Microbasic *p*-mastigophore	15.61 - 21.8	19.39	2.1	3.9 - 6.08	5.06	0.61	19	1	2/2
	Filament	Basitrich	10.45 - 14.17	12.33	1.04	1.6 - 2.62	2.00	0.23	29	5	2/2
		Long curve basitrich	29.02 - 42.02	35.44	4.55	1.74 - 4.38	2.80	0.98	0	5	1/2
		Microbasic *b*-mastigophore	17.1 - 35.61	32.63	4.00	2.57 - 4.14	3.45	0.34	2	19	2/2
		Microbasic *p*-mastigophore	16.78 - 24.63	21.00	2.09	2.52 - 6.2	4.38	0.92	32	13	2/2
Bunodosoma cavernatum	Tentacle	Basitrich	7.47 - 12.54	9.92	2.17	1.29 - 2.53	1.8	0.45	1	4	2/2
		Basitrich	15.81 - 24.83	19.42	1.39	1.83 - 2.88	2.39	0.24	34	38	2/2
		Spirocyst	8.26 - 21.37	14.58	3.33	1.81 - 2.77	2.28	0.39	16	32	2/2
	Acrorhagi	Basitrich	6.85 - 22.52	13.25	4.3	1.18 - 3.59	2.29	0.58	34	29	2/2
		Spirocyst	19.72 - 24.7	21.12	2.09	2.47 - 3.61	2.76	0.51	3	2	2/2
		Holotrich	17.95 - 43.54	33.41	7.25	3.15 - 5.82	4.61	0.54	20	28	2/2
	Actinopharynx	Basitrich	6.9 - 9.91	8.3	1.13	1.33 - 2.17	1.84	0.28	10	2	2/2
		Basitrich	10.57 - 30.03	19	5.52	1.73 - 4.42	2.8	0.64	49	29	2/2
		Microbasic *p*-mastigophore	16.06 - 18.89	17.71	1.24	4.43 - 5.12	4.76	0.3	2	2	2/2
	Column	Basitrich	7.55 - 9.15	8.16	1.2	1.37 - 2.65	1.37	2.65	1	3	2/2
		Basitrich	11.94- 21.83	15.17	2.39	1.81 - 4.5	2.48	0.53	47	28	2/2
	Filament	Basitrich	9.67 - 16.15	12.78	1.89	1.6 - 3.01	2.08	0.4	5	12	2/2
		Microbasic *b*-mastigophore	27.7 - 40.58	35.64	3.03	4.21 - 6.9	5.74	0.62	30	11	2/2
		Microbasic *p*-mastigophore	13.65 - 22.82	19.44	1.33	2.81 - 6.6	5.2	0.53	52	33	2/2

Table III. Continuation.

Bunodosoma granuliferum	**Tentacle**	Basitrich	9.34 - 14.81	12.04	2.38	1.5 - 2.06	1.81	0.28	3	1	2/2
		Basitrich	18.93 - 33.96	24.94	3.17	2.01 - 3.78	2.64	0.33	28	31	2/2
		Spirocyst	10.71 - 30.81	18.47	5.17	1.96 - 3.56	2.58	0.39	32	15	2/2
	Acrorhagi	Basitrich	10.47 - 26.9	18.79	3.97	1.86 - 3.69	2.56	0.42	3	25	2/2
		Holotrich	26.45 - 50.01	40.37	4.81	2.64 - 5.37	4.07	0.72	31	0	1/2
		Spirocyst	13.82 - 20.63	16.72	3.08	2.35 - 2.72	2.55	0.16	29	1	2/2
	Actinopharynx	Basitrich	11.26 - 16.7	13.4	2.11	1.73 - 3.01	2.24	0.47	1	4	2/2
		Basitrich	18.45 - 29.3	25.38	2.13	2.58 - 4.28	3.46	0.39	30	28	2/2
		Spirocyst	10.6 - 13.05	11.63	1.27	2.04 - 3.02	2.52	0.49	3	0	2/2
		Microbasic *p*-mastigophore	17.73 - 20.44	19.28	1.21	4.03 - 5.18	4.58	0.57	4	0	2/2
	Column	Basitrich	11.95 - 19.76	16.29	2.08	1.8 - 3.35	2.34	0.32	30	15	2/2
		Basitrich	20.23 - 25.71	23.12	2.1	2.11 - 3.75	2.95	0.36	2	11	2/2
		Spirocyst	15.88 - 21.23	18.55	3.78	2.08 - 2.46	2.27	0.27	2	0	2/2
	Filament	Basitrich	10.09 - 14.26	12.24	1.43	1.89 - 2.36	2.14	0.18	6	2	2/2
		Basitrich	22.52 - 25.59	24.05	2.17	2.80 - 3.33	3.07	0.36	1	1	2/2
		Microbasic *b*-mastigophore	14.12 - 47.14	31.99	9.1	2.85 - 8.93	5.7	1.52	8	8	2/2
		Microbasic *p*-mastigophore	12.14 - 23.62	19.39	3.01	2.97 - 6.22	4.49	0.78	29	29	2/2
Exaiptasia diaphana	**Tentacle**	Basitrich	12.16 - 19.08	15.2	1.47	2.05 - 3.47	2.55	0.32	30	30	2/2
		Spirocyst	8.87 - 22.49	14.12	3.26	1.72 - 3.89	2.88	0.5	30	10	2/2
		Microbasic *p*-amastigophore	20.36 - 32.6	28.04	2.71	3.76 - 5.54	4.79	0.41	30	8	2/2
	Acontia	Basitrich	18.79 - 27.89	23.47	2.01	2.16 - 3.53	2.87	0.37	7	25	2/2
		Microbasic *p*-amastigophore	26.97 - 69.3	57.99	7.22	3.44 - 8.44	6.18	1.09	18	23	2/2
	Actinopharynx	Basitrich	10.63 - 21.89	18.69	2.76	2.02 - 3.79	2.90	0.43	18	8	2/2
		Microbasic *p*-amastigophore	15.91 - 29.89	25.02	2.13	3.17 - 5.95	4.28	0.53	30	30	2/2
	Filament	Basitrich	8.2 - 16.61	12.26	2.07	1.61 - 3.25	2.43	0.42	14	7	2/2
		Microbasic *p*-amastigophore	9.76 - 18.36	12.72	1.28	1.92 - 3.58	2.64	0.30	30	22	2/2
		Microbasic *p*-amastigophore	18.74 - 63.4	31.65	15.29	2.88 - 6.35	4.37	1.11	6	4	2/2
	Column	Basitrich	6.81 - 15.5	11.42	1.68	1.72 - 3.79	2.68	0.50	30	30	2/2
		Microbasic *p*-amastigophore	9.54 - 18.97	16.38	1.61	2.06 - 5.22	4.23	0.50	30	28	2/2
		Microbasic *b*-mastigophore	10.93 - 15.98	13.90	1.15	2.84 - 4.78	4.10	0.33	26	26	2/2

Size

Fully expanded distal end up to 42.3 mm in diameter, oral disc about 14 mm in diameter, tentacles to 8.4-14.9 mm in length, column 24.4 mm in height and 21.4 mm in diameter, pedal disc to 23.2 mm in diameter.

Natural history

Actinostella flosculifera lives attached to buried rocks, in seagrass fields, between 0.1 to 5 m depths (González-Muñoz et al. 2012, 2016). Abundant zooxanthellae are found in the marginal ruff and tentacles. Häussermann (2004) reported that marginal ruff remains fully expanded during the day, allowing zooxanthellae to capture sunlight, but during the night, the tentacles remain expanded to capture food. In the Atlántico Department was found at 0.4 m depth, attached to rock surfaces.

Distribution

Along the entire Caribbean Sea, from Bermuda to Brazil, including the southern Gulf of Mexico (González-Muñoz et al. 2012, 2013, 2016); it has also been reported in the Canary Islands (Ocaña & den Hartog 2002) and the Gulf of Guinea (Wirtz 2003). It has been previously reported in the Colombian Caribbean in Santa Marta (Punta Betín), Tayrona National Park (Concha Bay and Nenguange) (Manjarrés 1978) and Rosario Island, Cartagena (Manjarrés 1979) (Table I), but this is the first record from the Atlántico Department at Puerto Velero (PV3) and Caño Dulce beaches (CD1).

Remarks

Besides *A. flosculifera*, the species *A. radiata* (Duchassaing & Michelotti 1860) and *A. variabilis* (Hargitt 1911) have also been recorded in the Caribbean Sea (González-Muñoz et al. 2012). Taxonomic information of *A. radiata* available is incomplete and thus prevents proper taxonomic comparisons with *A. flosculifera*. The specimens described as *Cradactis variabilis* (= *Actinostella variabilis*) by Hargitt (1911) actually belongs to the species *Lebrunia coralligens* (Wilson, 1890) (González-Muñoz et al. 2012). In addition to the cnidom of *A. flosculifera* reported by González-Muñoz et al. (2012), in the Colombian material we found microbasic *p*-mastigophores in the column and in the filaments of two specimens, as well as spirocysts in the actinopharynx of one specimen.

Genus *Bunodosoma* Verrill, 1899

***Bunodosoma cavernatum* (Bosc, 1802)**

(Figs. 3a-q)

Examined material

Caño Dulce Beach (CD1): one specimen (UARC-CNI 068), Puerto Velero Beach (PV3): three specimens (UARC-CNI 063, 064, 067).

External anatomy

Oral disc smooth, olive-green with yellowish radial stripes (Fig. 3d). Tentacles approximately 96 in number, hexamerously arranged in five cycles, smooth, simple, conical, inner cycles longer than outer ones, contractile. Tentacles translucent, dark-blue, pale-brown or light-yellow, often with orange or light-red spots both partial (Figs. 3c and e) to total (Figs. 3a-b) on the back of the tentacle in the first three cycles, and pale-yellowish spots in the tentacles of the fourth cycle (Figs. 3a, c-e). Margin with 48 rounded marginal projections with acrorhagi (containing basitrichs and holotrichs) (Figs. 3b-c). Column cylindrical, densely covered with rounded dark vesicles arranged in longitudinal rows. Pedal disc well-developed (Fig. 3c). Column and pedal disc pale-orange (Fig. 3c) to pale-brown (Fig. 3d). Zooxanthellate.

Internal anatomy: See González-Muñoz et al. (2013).

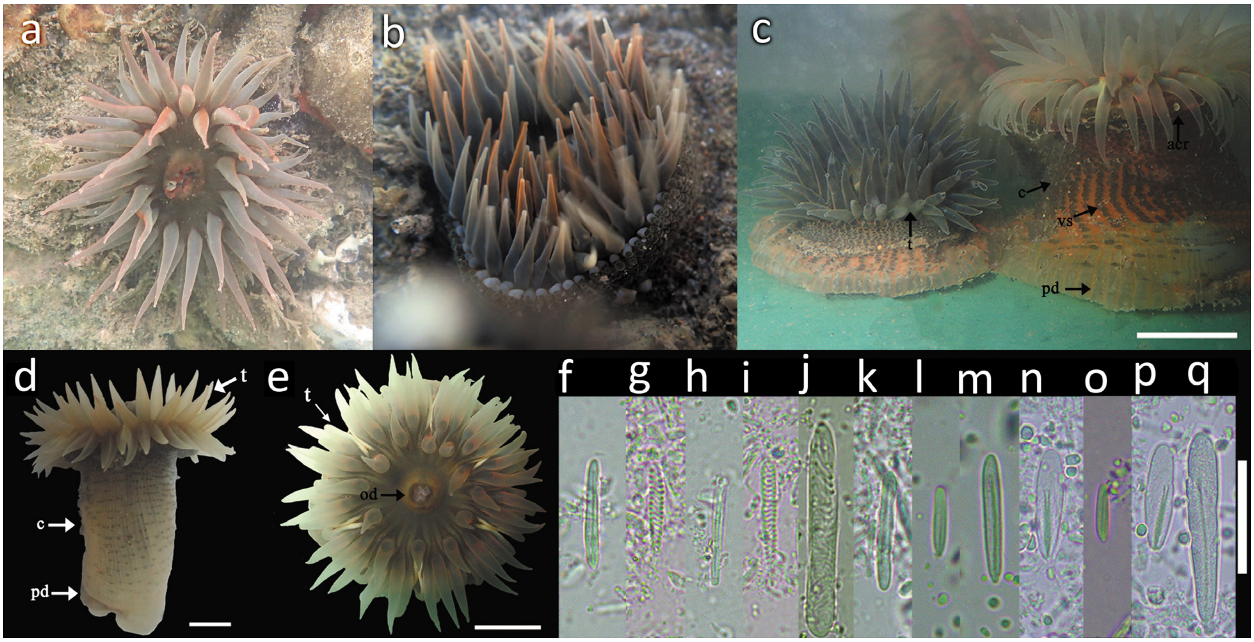

Figure 3. ***Bunodosoma cavernatum*** **(Bosc, 1802). a-b Live specimen in natural habitat. c Lateral view of two different specimens. d Lateral view. e Oral view. f-q Cnidae. - tentacle: f basitrich g spirocyst; acrorhagi: h basitrich i spirocyst j holotrich; column: k basitrich; actinopharynx: l small basitrich m basitrich n microbasic *p*-mastigophore; filament: o small basitrich p microbasic *p*-mastigophore q microbasic *b*-mastigophore. Abbreviations. –acr: acrorhagi, c: column, od: oral disc, pd: pedal disc, t: tentacle, vs: vesicles. Scale bars: c-e: 10 mm; f-q: 20 µm.**

Cnidae: basitrichs, spirocysts, holotrichs, microbasic *b*- and *p*-mastigophores (Figs. 3f-q; Table III).

Size

A fully expanded distal end to 54.5-56.9 mm in diameter, oral disc to 33.1 mm in diameter, tentacles to 7.3-17.5 mm in length, column to 19.4-39.5 mm in height and 20.4-22.9 mm in diameter, pedal disc to 15.5-22.1 mm in diameter.

Natural history

Bunodosoma cavernatum lives attached to rocky substrates at 0.5-7 m depth, in coral reefs, rocky shores, and seagrass fields (González-Muñoz et al. 2013, 2016). In the Atlántico Department it was found in the intertidal and subtidal zones, between 0.1 to 1.5 m depth, attached on rocks or metal sheets.

Distribution

Along the western Atlantic coast and the Caribbean Sea, from North Carolina to Barbados (González-Muñoz et al. 2013), and the Caroline Islands, Micronesia (Bosc 1802). This is the first record of *B. cavernatum* in the Colombian Caribbean.

Remarks

Four valid species of genus *Bunodosoma* have been reported in the Caribbean Sea. *Bunodosoma cavernatum* and *B. granuliferum* (Le Sueur, 1817) mainly differ in their column color patterns, being beige, pale orange or reddish in the former, while the column of *B. granuliferum* presents a characteristic pattern of alternating light and dark longitudinal bands. The other two species, *B. kuekenthali* Pax, 1910 and *B. sphaerulatum* Durden, 1902, are currently considered valid species (Fautin 2016), although the distinction between these two species and *B. cavernatum* remains unclear and needs further revision.

Bunodosoma granuliferum **(Le Sueur, 1817) (Figs. 4a-s)**

Examined material: Puerto Velero Beach (PV3): three specimens (UARC-CNI 061, 062, 069).

External anatomy

Oral disc smooth, flat, reddish-brown of green. Tentacles approximately 96 in number, hexamerously arranged in five cycles, smooth, simple, inner cycles longer than outer ones, contractile. Tentacles olive-green to green-greyish or light-yellow, often with white spots and flashes of purple or pink. Margin with 48 rounded marginal projections with acrorhagi (containing basitrichs and holotrichs). Column cylindrical, densely covered with rounded vesicles arranged in 24 alternating dark and light longitudinal bands (dark bands with about five rows of vesicles, light ones with about three). Pedal disc well-developed, olive-green to orange. Zooxanthellate.

Internal anatomy: See González-Muñoz et al. (2012).

Cnidae: basitrichs, spirocysts, holotrichs, microbasic *b*- and *p*-mastigophores (Figs. 4e-s; Table III).

Size

Fully expanded distal end to 95.2 mm in diameter, oral disc to 46.1 mm in diameter, tentacles to 16.4-20.4 mm in length, column to 40.1 mm in height and 36.8 mm in diameter, pedal disc to 21.4 mm in diameter.

Natural history

Bunodosoma granuliferum lives attached to rocky substrates between 0.5 and 6 m depth,

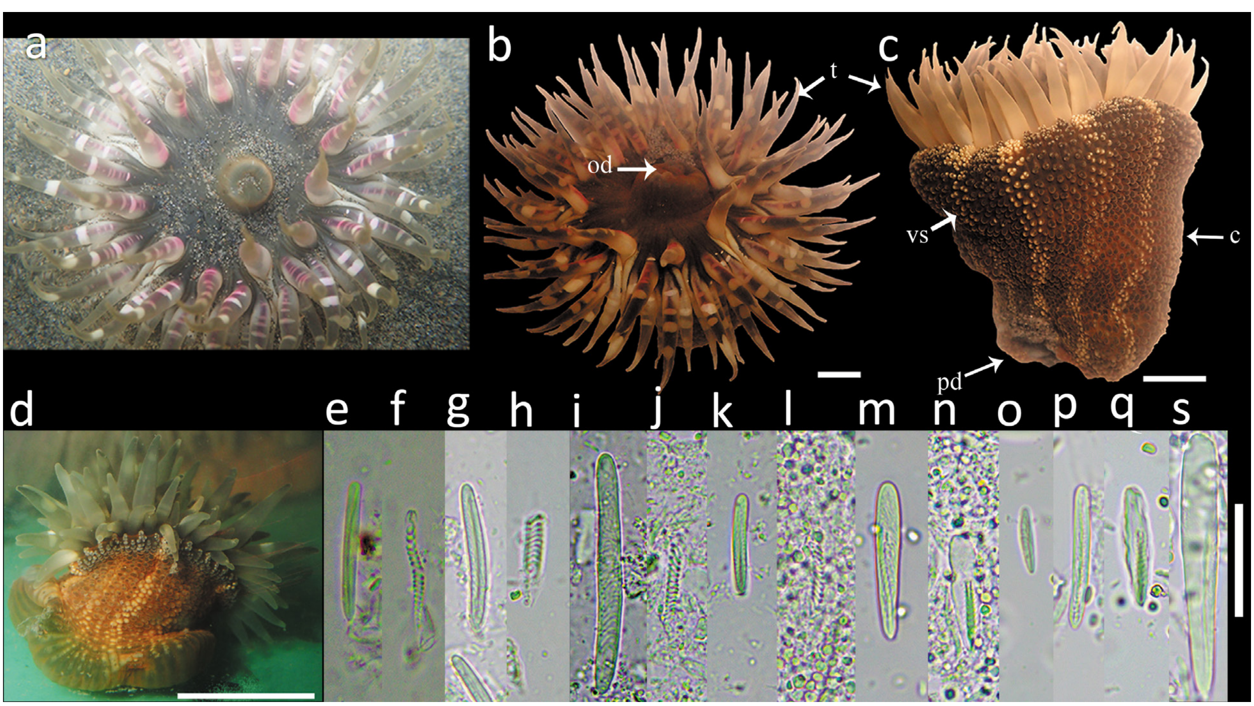

Figure 4. *Bunodosoma granuliferum* **(Le Sueur, 1817). a live specimen in natural habitat. b oral view. c lateral view. d lateral view of the second specimen. e-s Cnidae. - tentacle: e basitrich f spirocyst; acrorhagi: g basitrich h spirocyst i holotrich; column: j spirocyst k basitrich; actinopharynx: l spirocyst m basitrich n microbasic *p*-mastigophore; filament: o small basitrich p basitrich q microbasic *p*-mastigophore s microbasic *b*-mastigophore. Abbreviations. –c: column, od: oral disc, pd: pedal disc, t: tentacle, vs: vesicles. Scale bars: b-d: 10 mm; e-s: 20 µm.**

in coral reefs, rocky shores, and seagrasses fields (González-Muñoz et al. 2012, 2016). In the Atlántico Department, it was found in the intertidal and subtidal zones at depths between 0.5 and 1.5 m, attached on rocks or metal sheets.

Distribution

Along the entire Caribbean Sea, from Bermuda to Barbados, including the southern Gulf of Mexico (González-Muñoz et al. 2012, 2013, 2015, 2016). It has been previously reported in the Colombian Caribbean in San Andres, Providencia and Santa Catalina Islands (Werding et al. 1981, SIBM 2020), and Punta Betín and Nenguange (Manjarrés 1977), but this is the first record of *B. granuliferum* in the Atlántico Department at Puerto Velero (PV1 and PV3) and Caño Dulce beaches (CD1 and CD2).

Remarks

Bunodosoma granuliferum differs from *B. cavernatum* by the column coloration pattern of alternating pale and dark longitudinal bands. Like González-Muñoz et al. (2012), we found spirocysts in the tentacles of the specimens examined, but also in the acrorhagi, filaments and actinopharynx. Holotrichs were observed only in one of the two specimens examined.

Superfamily Metridioidea Carlgren, 1893

Family Aiptasiidae Carlgren, 1924

Genus *Exaiptasia* Grajales & Rodríguez, 2014

***Exaiptasia diaphana* (Rapp, 1829)**

(Figs. 5 a-p)

Examined material: Puerto Velero Beach (PV2), one juvenile specimen (UACR-CNI 065), and two adult specimens (UARC-CNI 075).

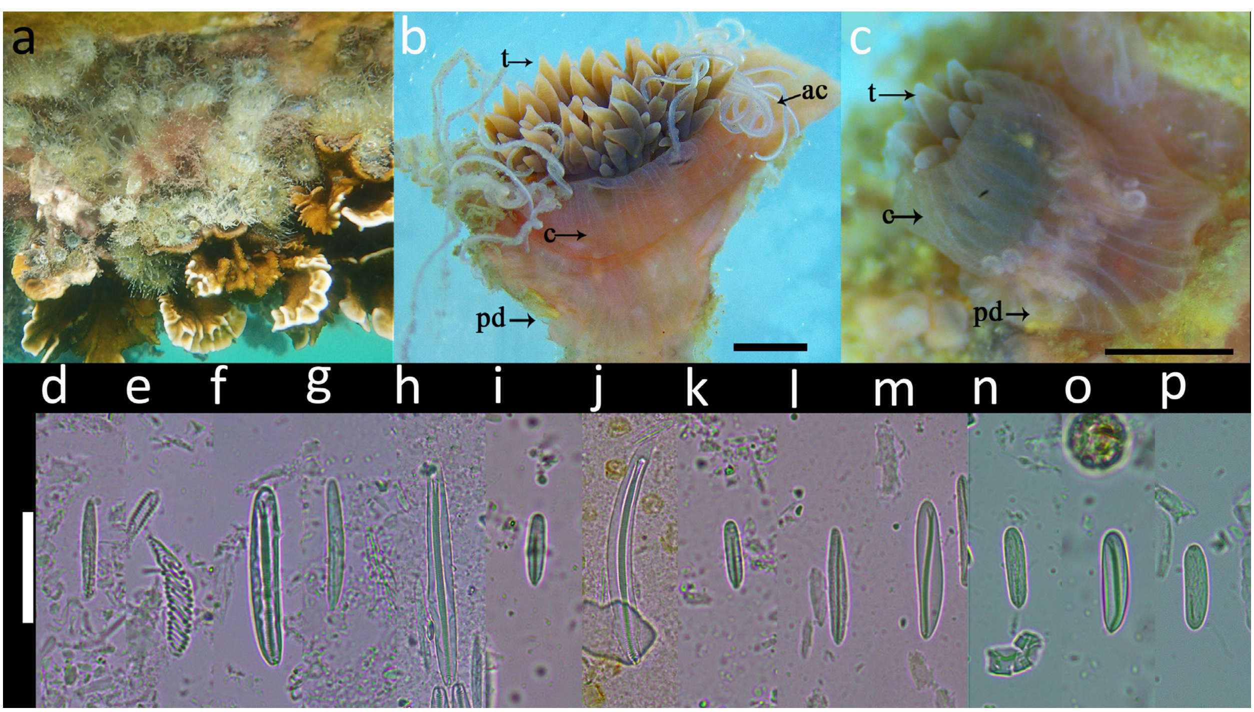

Figure 5. ***Exaiptasia diaphana*** **(Rapp, 1829). a live specimen in natural habitat. b lateral view. c young anemone on the adult column (b). d-p Cnidae. – tentacle: d basitrich e spirocyst f microbasic *p*-amastigophore; acontia: g basitrich h large microbasic *p*-amastigophore; filament: i basitrich j large microbasic *p*-amastigophore k microbasic *p*-amastigophore; actinopharynx: l basitrich m microbasic *p*-amastigophore; column: n basitrich o microbasic *p*-amastigophore p microbasic *b*-mastigophore. Abbreviations. –ac: acontia, c: column, t: tentacle, pd: pedal disc. Scale bars: b: 2 mm; c: 1 mm; d-g, i, k-p: 20 µm; h, j: 30 µm.**

External anatomy

Oral disc smooth, flat, brown or green. Tentacles 48 in number, hexamerously arranged in four cycles, simple, smooth, inner cycles longer than outer ones, contractile. Tentacles pale-orange to greyish or light-yellow, often with white spots. Column cylindrical, smooth, translucent light-pink. Pedal disc well-developed, translucent light-pink. White acontia protruding from cinclides and the mouth (containing basitrichs and large microbasic *p*-amastigophores). Zooxanthellate.

Internal anatomy: See González-Muñoz et al. (2012) and Grajales & Rodríguez (2014).

Cnidae: Basitrichs, spirocysts, microbasic *b*-mastigophores and *p*-amastigophores (Figs. 4d-p; Table III)

Size

Fully expanded distal end to 30.6-47.3 mm in diameter, oral disc to 12.3-28.6 mm in diameter, tentacles to 6.2-14.5 mm in length, column to 7.1-15.01 mm in height and 16.8-27.9 mm in diameter, pedal disc to 10.4-12.1 mm in diameter.

Natural history

Exaiptasia diaphana is a tropical and subtropical shallow-water species, preferring calm and protected waters, found between 0 to 5m depth (Grajales & Rodríguez 2014). In the Atlántico Department, it was observed at 0.5-2 m depth covering artificial substrates as concrete, rope and metal sheets, as well as on some corals, sponges, and ascidians.

Distribution

Exaiptasia diaphana is a widespread species recorded worldwide along the northwestern Atlantic coast (Fautin 2013), Gulf of Mexico (González-Muñoz et al. 2013), Caribbean Sea (González-Muñoz et al. 2012), the coast of Brazil in the southwestern Atlantic Ocean (Zamponi et al. 1998, Farrapeira et al. 2007), Galapagos Islands (Fautin et al. 2007), and Australia (Grajales & Rodríguez 2014). Grajales & Rodríguez (2014) extended the distribution of the species to the Mediterranean Sea, western Africa, east and west Pacific coasts, Japan, and Hawaii. This is the first record of *E. diaphana* in the Colombian Caribbean.

Remarks

This species was formerly known as *Exaiptasia pallida* (Grajales & Rodríguez 2014), but according to the ruling of the International Commission on Zoological Nomenclature (ICZN), the epithet *diaphana* retains priority over *pallida* and should be used as the name for this species (ICZN 2017). Criales (1984) mention *E. diaphana* (as *Aiptasia pallida*) as one of the sea anemone hosts species that could be found associated to the cleaner shrimp *Periclimenes pedersoni* Chace, 1958. However, Criales (1984) did not include this species in her list of sea anemones hosts found in the Santa Marta region of Colombia (Criales 1984). Thus, it is our interpretation that Criales (1984) did not observe this sea anemone species in the 1984 study, and thus we here document the first record of *E. diaphana* in the Colombian Caribbean.

DISCUSSION

The new records of *B. cavernatum* and *E. diaphana* increase to 21 the number of sea anemone species for the Colombian Caribbean. These are not all the species found in the area but are those for which there are no unresolved taxonomic problems. There are at least other 13 actiniarian species that have been reported in the region but have been identified only to genus (8), family (3), superfamily (1) or to order (1) (Table I). Barrios-Suárez et al. (2002)

documented four corallimorpharians and eleven actiniarians, including *Alicia* sp., *Halcampactis* sp., and *Phymanthus* sp., as well as a member of family Isophellidae (synonymized with family Andvakiidae by Rodríguez et al. 2012), and a member of superfamily Acontiaria (currently within superfamily Metridioidea since Rodríguez et al. 2014). Flórez & Santodomingo (2010) reported four species and one genus at a depths of 200 to 500 m (*Leipsiceras pollens* (McMurrich, 1898), *Amphianthus caribaeus* (Verrill, 1899) (= *Amphianthus caribaea*), *Daontesia* sp. Carlgren, 1942, *Actinauge longicornis* (Verrill, 1882) and *Monactis vestita* (Gravier, 1918)). Gracia et al. (2013) reported two morpho-species of the genus *Aiptasia* on the La Guajira gas platform. Recently, Dueñas et al. (2019) reported *Adamsia* sp. (synonymized with genus *Paracalliactis* by Gusmão et al. 2019) and *Phelliactis* sp., as well as members of families Hormathiidae and Kadosactinidae, and another Actiniaria, from deep-sea bottoms in the south-western Colombian Caribbean.

The effect of the high turbidity and low salinity rates on the diversity of shallow-water sea anemones is still unclear, but appears that some species are able to tolerate stressful conditions. For example, Pereira et al. (2003) reported the species *Anemonia sargassensis* Hargitt, 1908 living on artificial substrates (breakwaters) at Casa Caiada Beach (Brazil), with a density of 20 ind/m^2, water transparency between 1 to 1.5 m, suspended particulate material of 0.016 g/L, and salinity between 34.3 to 36.6 ppm. Moreover, Liu et al. (2015) used mesocosm experiments to simulate environments with nutrient enrichment (nitrate, phosphate and ammonium), high levels of turbidity (10-15 NTU), sedimentation (0.11-0.27 g/L) and salinity of 33 ppm, and they found that the sea anemone *Mesactinia ganesis* England, 1987 tolerated these conditions and was even able to attack corals as *Acropora muricata* (Linnaeus, 1758), causing their death.

In the Atlántico Department, *E. diaphana* was found in high densities (about 203 ind/m^2) and abundances ranging from 74 to 524 individuals, covering artificial substrates. This could be related to the diverse reproductive strategies that *E. diaphana* exhibits, and the effects of environmental conditions on its asexual (pedal laceration) and sexual reproduction (sexual plasticity and interclonal fertilization), which allows it to successfully invade artificial marine substrates (Schlesinger et al. 2010). On the other hand, it has been suggested that a combined effect of variables (i.e., short-term sedimentation and nutrient enrichment) could cause replacement of corals by anemones on some studied coral reefs (Liu et al. 2015). In such a case, reproduction strategies could play an important role, due to the fact that sea anemones tend to increase their asexual reproduction rates under conditions of high nutrient exposure (Liu et al. 2015).

Although our results suggest that these species can tolerate or even benefit (e.g., *E. diaphana*) from the seemingly stressful conditions of the Magdalena River discharges, more studies are necessary to understand the physiological processes involved in their presence under these environments, as well as to determine the current diversity of sea anemones inhabiting the area.

Acknowledgments

We thank Dr. Nelson Rangel-Buitrago and Yully Contreras for assistance with some field trips and Dr. James D. Reimer (University of the Ryukyus, Japan) for his contributions and improvements to the document. This work is a contribution of the research group "Geology, Geophysics, and Marine - Coastal Process," Universidad del Atlántico (Barranquilla, Colombia).

REFERENCES

BARRIOS-SUÁREZ LM, REYES JO, NAVAS GR & GARCÍA CB. 2002. Distribution of anemones (Anthozoa: Actiniaria and Corallimorpharia) in the area of Santa Marta, Colombian Caribbean. Cienc Mar 28: 37-48.

BOSC LAG. 1802. Historie Naturalle des Vers. Paris, Chez Deterville, France, p. 300.

BRATTSTRÖM H. 1980. Rocky-shore zonation in the Santa Marta area, Colombia. Sarsia 65: 163-226.

CAIRNS SD. 1999. Species richness of recent Scleractinia. NMNH, Smithsonian Institution. Washington DC, U.S.A.

CENDALES MH, ZEA S & DÍAZ JM. 2002. Geomorfología y unidades ecológicas del complejo de arrecifes de las Islas del Rosario e Isla Barú (Mar Caribe, Colombia). Rev Acad Colomb Cienc 26: 497-510.

CRIALES MM. 1984. Shrimps associated with coelenterates, echinoderms, and molluscs in the Santa Marta region, Colombia. J Crustacean Biol 4: 307-317.

DALY M & DEN HARTOG JC. 2004. *Anthopleura* (Cnidaria: Anthozoa: Actiniaria) from the Gulf of Mexico and Caribbean. B Mar Sci 74: 401-421.

DÍAZ JM, SÁNCHEZ JA & DÍAZ-PULIDO G. 1996. Geomorfología y formaciones arrecifales recientes de Isla Fuerte y Bajo Bushnell, plataforma continental del Caribe colombiano. Bol Invest Mar Cost 25: 87-105.

DÍAZ JM, BARRIOS LM, CENDALES MH, GARZÓN-FERREIRA J, GEISTER J, LÓPEZ-VICTORIA M, OSPINA GH, PARRA-VELANDIA F, PINZÓN J, VARGAS-ANGEL B, ZAPATA FA & ZEA S. 2000. Áreas coralinas de Colombia. Santa Marta: INVEMAR, 176 p.

DUEÑAS L, CEDEÑO-POSSO C, GRAJALES A, HERRERA H, RODRÍGUEZ E, SÁNCHEZ JA, LEÓN J & PUENTES V. 2019. First visual occurrence data for deep-sea cnidarians in the South-western Colombian Caribbean. Biodivers Data J 7: e33091.

DURÁN-FUENTES J, GRACIA A, OSORIO C & CEDEÑO-POSSO C. 2018. Aporte al conocimiento de las medusas (Cnidaria: Medusozoa) en el departamento del Atlántico, Colombia. Rev Acad Colomb Cienc 42: 49-57.

FARRAPEIRA C, MELO A, BARBOSA DF & SILVA K. 2007. Ship hull fouling in the Port of Recife, Pernambuco. Braz J Oceanogr 55: 207-221.

FAUTIN DG, CLEVELAND P, HICKMAN JR, DALY M & MOLODTSOVA T. 2007. Shallow-water sea anemones (Cnidaria: Anthozoa: Actiniaria) and tube anemones (Cnidaria: Anthozoa: Ceriantharia) of the Galápagos Islands. Pac Sci 61: 549-573.

FAUTIN DG. 2013. Hexacorallians of the World. http://geoportal.kgs.ku.edu/hexacoral/anemone2/index.cfm. Accessed 15 December 2018.

FAUTIN DG. 2016. Catalog to families, genera, and species of orders Actiniaria and Corallimorpharia (Cnidaria: Anthozoa). Zootaxa 4145: 1-449.

FLÓREZ P & SANTODOMINGO N. 2010. Cnidaria: Corales escleractinios, antipatarios, anémonas, zoantídeos, octocorales e hidroides. In: INVEMAR (Eds), Biodiversidad del margen continental del Caribe colombiano. Santa Marta: INVEMAR, p. 151-173.

GONZÁLEZ-MUÑOZ R, SIMÕES N, SÁNCHEZ-RODRÍGUEZ J, RODRÍGUEZ E & SEGURA-PUERTAS L. 2012. First inventory of sea anemones (Cnidaria: Actiniaria) of the Mexican Caribbean. Zootaxa 3556: 1-38.

GONZÁLEZ-MUÑOZ R, SIMÕES N, TELLO-MUSI JL & RODRÍGUEZ E. 2013. Sea anemones (Cnidaria, Anthozoa, Actiniaria) from coral reefs in the southern Gulf of Mexico. ZooKeys 341: 77-106.

GONZÁLEZ-MUÑOZ R, TELLO-MUSI JL & SIMÕES N. 2015. Las anémonas del Sistema Arrecifal Veracruzano. In: Granados-Barba A, Ortiz-Lozano LD, Salas-Monreal D & González-Gándara C (Eds), Aportes al conocimiento del Sistema Arrecifal Veracruzano: hacia el corredor arrecifal del Suroeste del Golfo de México, 1st ed., San Francisco de Campeche: Universidad Autónoma de Campeche, p. 101-118.

GONZÁLEZ-MUÑOZ R ET AL. 2016. Sea anemones (Cnidaria: Actiniaria, Corallimorpharia, Ceriantharia, Zoanthidea) from marine shallow-water environments in Venezuela: new records and an updated inventory. Mar Biodivers Rec 9: 18.

GRACIA A, CRUZ N, BORRERO G, BÁEZ DP & SANTODOMINGO N. 2013. Invertebrados marinos asociados con las plataformas de gas en La Guajira (Caribe Colombiano). Bol Invest Mar Cost 42: 361-386.

GRAJALES A & RODRÍGUEZ E. 2014. Morphological revision of the genus *Aiptasia* and the family Aiptasiidae (Cnidaria, Actiniaria, Metridioidea). Zootaxa 3826: 55-100.

GUSMÃO LC RODRÍGUEZ E & DALY M. 2019. Description of *Calliactis tigris* sp. nov.: reconciling taxonomy and phylogeny in hermit-crab symbiotic anemones (Cnidaria: Actiniaria: Hormathiidae). Org Divers Evol 1-17.

HÄUSSERMANN V. 2004. Identification and taxonomy of soft-bodied hexacorals exemplified by Chilean sea anemones; including guidelines for sampling, preservation and examination. J Mar Biol Assoc UK 84: 931-936.

HARGITT CW. 1911. *Cradactis variabilis*: an apparently new Tortugan actinian. Carnegie Instit Wash 3: 51-53.

ICZN. 2017. Opinion 2404 (Case 3633) — *Dysactis pallida* Agassiz in Verrill, 1864 (currently *Aiptasia pallida*; Cnidaria, Anthozoa, Hexacorallia, Actiniaria): precedence over *Aiptasia diaphana* (Rapp, 1829), *Aiptasia tagetes* (Duchassaing de Fombressin and Michelotti, 1864), *Aiptasia mimosa* (Duchassaing de Fombressin & Michelotti, 1864) and *Aiptasia inula* (Duchassaing de Fombressin & Michelotti, 1864) not approved. Bull Zool Nomencl 74: 130-132.

LIU PJ, HSIN MC, HUANG YH, FAN TY, MENG PJ, LU CC & LIN HJ. 2015. Nutrient enrichment coupled with sedimentation favors sea anemones over corals. PloS One 10: e0125175.

MANJARRÉS GA. 1977. Contribución al conocimiento de las Actinias en la región de Santa Marta. An Ins Invest Mar Punt Betín 9: 91-104.

MANJARRÉS GA. 1978. Nuevos encuentros de actinias (Hexacorallia) en la región de Santa Marta, Colombia. An Ins Invest Mar Punt Betín 10: 127-132.

MANJARRÉS GA. 1979. Observaciones sobre los Anthozoa (excepto Madreporaria) en las islas del Rosario, Santa Marta, Colombia. An Ins Invest Mar Punt Betín 11: 23-24.

OCAÑA Ó & DEN HARTOG JC. 2002. A catalogue of actiniaria and corallimorpharia from the Canary Islands and from Madeira. Arquipélago 19: 33-54.

ÖSTMAN C. 2000. A guideline to nematocyst nomenclature and classification, and some notes on the systematic value of nematocysts. Scie Mar 64: 31-46.

PEREIRA LCC, JIMÉNEZ JA, GOMES PB, MEDEIROS C & COSTA RAA. 2003. Effects of sedimentation on scleractinian and actinian species in artificial reefs at the Casa Caiada beach (Brazil). J Coastal Res 35: 418-425.

POSADA B & HENAO W. 2008. Diagnóstico de la erosión en la zona costera del Caribe colombiano. Santa Marta: INVEMAR, 200 p.

RANGEL-BUITRAGO N, WILLIAMS A, ANFUSO G, ÁRIAS M & GRACIA A. 2017. Magnitudes, sources, and management of beach litter along the Atlántico department coastline, Caribbean coast of Colombia. Ocean Coast Manag 138: 142-157.

RESTREPO JD, ZAPATA P, DÍAZ JM, GARZÓN-FERREIRA J & GARCÍA CB. 2006. Fluvial fluxes into the Caribbean Sea and their impact on coastal ecosystems: The Magdalena River, Colombia. Glob Planet Change 50: 33-49.

RESTREPO JC, OREJARENA O & TORREGROZA AC. 2017. Suspended sediment load in northwestern South America (Colombia): A new view on variability and fluxes into the Caribbean Sea. J South Amer Earth Sci 80: 340-352.

REYES RR & CAMPO N. 1992. Macroinvertebrados colonizadores de raíces de *Rhizophora mangle* en la Bahía de Chengue, Caribe colombiano. Bol Invest Mar Cost 21: 101-116.

REYES J. 2000. Lista de los corales (Cnidaria: Anthozoa: Scleractinia) de Colombia. Bio Col 1: 164-176.

REYES J, SANTODOMINGO N & FLÓREZ P. 2010. Corales escleractinios de Colombia. Santa Marta: INVEMAR, 246 p.

RIEMANN-ZÜRNECK K. 1972. Über Aktinien aus der Karibik: *Rhodactis*, *Condylactis*, *Bartholomea*. Mitt. Inst Colombo-Alemán Invest Cie 6: 73-76.

RODRÍGUEZ E, BARBEITOS M, DALY M, GUSMAO LC & HÄUSSERMANN V. 2012. Toward a natural classification: phylogeny of acontiate sea anemones (Cnidaria, Anthozoa, Actiniaria). Cladistics 28: 375-392.

RODRÍGUEZ E, BARBEITOS MS, BRUGLER MR, CROWLEY LM, GRAJALES A, GUSMÃO L, HÄUSSERMANN V, REFT A & DALY M. 2014. Hidden among sea anemones: the first comprehensive phylogenetic reconstruction of the order Actiniaria (Cnidaria, Anthozoa, Hexacorallia) reveals a novel group of hexacorals. PLoS One 9: e96998.

SCHLESINGER A, KRAMARSKY-WINTER E, ROSENFELD H, ARMOZA-ZVOLONI R & LOYA Y. 2010. Sexual plasticity and self-fertilization in the sea anemone *Aiptasia diaphana*. PloS One 5: e11874.

SIBM. 2020. Sistema de Información sobre Biodiversidad Marina de Colombia. Instituto de Investigaciones Marinas y Costeras – INVEMAR. http://www.invemar.org.co/siam/sibm. Accessed 15 December 2020.

VEGA-SEQUEDA J, RODRÍGUEZ-RAMÍREZ A, REYES-NIVIA MC & NAVAS-CAMACHO R. 2008. Formaciones coralinas del área de Santa Marta: estado y patrones de distribución espacial de la comunidad bentónica. Bol Invest Mar Cost 37: 87-105.

WERDING B, GARZÓN-FERREIRA L & ZEA S. 1981. Informe sobre los resultados de la expedición Providencia I a las islas de Providencia y Santa catalina (Colombia). Ins Invest Mar Punt Betín.

WIRTZ P. 2003. New records of marine invertebrates from São Tomé Island (Gulf of Guinea). J Mar Biol Ass UK 83: 735-736.

ZAMPONI M, BELÉM M, SCHLENZ E & ACUÑA FH. 1998. Distribution and some ecological aspects of Corallimorpharia and

Actiniaria from shallow waters of the South American Atlantic coasts. Physis 55: 31-45.

How to cite
DURÁN-FUENTES J, GRACIA A & GONZÁLEZ-MUÑOZ R. 2021. Sea anemones (Cnidaria, Anthozoa, Actiniaria) in high sedimentation environments influenced by the Magdalena River (Colombian Caribbean). An Acad Bras Cienc 94: e20190862. DOI 10.1590/0001-3765202120190862.

Manuscript received on July 27, 2019;
accepted for publication on May 3, 2020

JEFERSON DURÁN-FUENTES[1]
https://orcid.org/0000-0001-6018-8699

ADRIANA GRACIA[1]
https://orcid.org/0000-0002-4771-5295

RICARDO GONZÁLEZ-MUÑOZ[2]
https://orcid.org/0000-0002-9509-0269

[1]Universidad del Atlántico, Programa de Biología, Facultad de Ciencias Básicas, Km 7, 8-49, Puerto Colombia, Atlántico, Colombia

[2]Laboratorio de Biología de Cnidarios, Instituto de Investigaciones Marinas y Costeras, Facultad de Ciencias Exactas y Naturales, Universidad Nacional de Mar del Plata-CONICET, Rodríguez Peña 4046, 7600 Mar del Plata, Argentina

Corresponding author: **Jeferson Durán-Fuentes**
E-mail: jalexisduran@mail.uniatlantico.edu.co

Author contributions

J.D. contributed to the design and implementation of the research, analysis and writing of the manuscript, and developed the study. A.G. contributed to the writing of the manuscript, analysis of the results, and developed the study. R.G-M. contributed to the writing and analysis of the document.